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ABSTRACT

The result of a curriculum development project known as Project Open, this curriculum guide offers a course on communication technology to ninth graders who are participating in the Career Exploration in Technology program and have completed the eighth grade course. Nineteen units form the subject matter of the guide: an introduction, visual communication technology, image recording, image projection, image design/layout, image carrier, image transfer, introduction to acoustic communication technology, acoustic communication, telegraph, telephone, magnetic reloading, phonograph, telecommunication technology, radio, television, videotape, computer, and satellite. Each unit gives an overview of its topic and objectives statement, followed by a detailed content outline, suggested time span, relevant resources, and a list of activities supportive to the content. The types of activities vary from class discussions, films, and demonstrations, to student design and construction of communication systems. Unit objectives are frequently divided into cognitive, affective, and psychomotor skills. References and resources include films, manuals, dictionaries, textbooks, and names and addresses of individuals and organizations who may be contacted for information. (For the final report of the project that developed this guide, see CE 018 781.) (ELG)

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CURRICULUM GUIDE FOR 9th GRADE

CAREER EXPLORATION IN TECHNOLOGY

WAHAMA SCHOOL

MASON, WEST VIRGINIA

1977-1978

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June, 1978
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CE 018 782

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PREFACE

This guide is to be used by the CEIT instructor for the 9th grade Wahama course as an aid for instruction and overall course structure. It was developed continually from July 1, 1975 to June 30, 1978 as a guide and not a "cookbook" for lesson plans and daily activities. The guide was developed to be flexible enough to meet the needs of the transition teacher and the school system.

This document resulted from a three year curriculum development project entitled "Project Open" which was undertaken through a contractual agreement between the Technology Education Program of West Virginia University and the Mason County Board of Education, Point Pleasant, West Virginia.

The authors would like to express their appreciation to the numerous persons from Mason County Schools, West Virginia University and the West Virginia State Department of Education for helping to make this project a success. Without the continued cooperation of these three agencies, a project of this type would not be possible. We appreciate the opportunity to work on a program as rewarding as this one.

G. L. Bacsa
J. H. Payne
June 30, 1978

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I. INTRODUCTION

The preadolescent junior high school student lives in a state of change. Students are expected to discard childhood behaviors and to adopt those of adulthood, thus this growth period is unique in a child's life. Our public education system must recognize this phenomenon and offer programs which reflect contemporary aspects of our technological society. A curriculum that emphasizes the role of technology in our society and culture will prepare students to meet the needs and demands of the future. Students need to be aware of and to understand our technological society if they hope to meet with success in life.

In order for the student to become an active, decision making individual in our technological society, a curriculum of technology education must be an integral part of general education. This curriculum must be flexible enough to adapt to the needs of the school, community and geographic locale. The Mason County school system has recognized this need, and has requested the Technology Education Program of West Virginia University to assist them in satisfying this goal.

In 1973, an experimental program at Wahama High School was developed in Career Exploration in Technology (CEIT). This initial course was introduced in the content area of technology and production. In 1975, a second CEIT program began its development at Wahama High School at the 9th grade level. This 9th grade program focused on technology and communications. The 8th grade project is now an integrated required course for all 8th grade students and is taught by a full time faculty member employed by the Mason County Board of Education.

The development of the 9th grade course and curriculum guide occurred as the result of a three year curriculum development project. In the first year (1975-76), many different concepts and activities were presented during the school year. The curriculum developers kept much data in the form of weekly reports and daily lesson plans, for this curriculum effort to improve the course for the second year. The second year's plan of action for (1976-77) was modified to improve course content and to integrate itself into the community. The third and final year of the project (1977-78) brought more improvement at meeting course objectives and directional goals. Each successive year, then, saw improvement over the previous year with help from the West Virginia University's Technology Education faculty and Mason County school personnel.

The teacher who uses this guide must understand that it is only a guide and not a "cookbook" for learning. It is designed so that the teacher can make alternations in the instructional plan to meet changing community needs.

Rationale for the Course

We live in a society strongly influenced by our technology. If our school systems are to reflect society, then technology should be included in the general education of students. A question soon arises: How do you introduce the study of technology into school systems? This question was answered by the Technology Education Program of West Virginia University. A change strategy known as Project Open was aimed at introducing curricula based on the study of technology within the public schools. (See Final Report Year 1977-78). Project Open developed technology-based curricula within respective schools, where inputs from the school, community and university could be monitored and evaluated. In this manner, each individual school may have its own program tailored to the school system.

Wahama High School now has a course entitled "Career Exploration in Technology" that is unique in nature and developed specifically for Mason County. If the words in the course title are examined, one can begin to understand the nature of the course. Career exploration as used in the course title, means that the activities in which students are involved will ultimately aid them in making career decisions. As course units of study are examined, career possibilities are emphasized so students will recognize occupations available in the area of communication technology. With this insight, students can tailor course schedules for the remainder of their school years to prepare themselves for a career.

The term "technology" as used in the course title is also significant in context of the CEIT course. The term is used to represent the creative actions and thought processes used by humans in order to achieve control of their environment. It should be evident from this definition that technology is more than tools, materials and processes. Technology is a distinctly human activity which affects all people in all cultures. Since its influence is so pervasive, all people ought to be cognizant of the effects of technology. This is the central content focus of the course-humans and their technology. Careers are examined within this context as an integral part of human activity.

The Project Site

Wahama High School is the location of this curriculum development project. The school was built near the towns of Mason and West Columbia, West Virginia. The student population comes from a relatively rural area to attend this high school which includes grades 7-12. The 9th grade CEIT course is taught in a classroom environment that is flexible enough in design to meet the needs of Mason County students for preparation to learn about our technological society. The course serves 85-120 students per year for which they receive one credit towards graduation.

Instructional Strategy

The following instructional strategy is suggested in order to enhance the students' ability to better understand the concepts and systems presented within this course.

I. Conceptual Learning

A. Introduce the unit concept.

B. Define or describe characteristics of the concept.

C. Describe how the concept could benefit the human race and the environment.

D. Describe how the concept could be harmful to the human race and the environment.

E. Allow the students the opportunity to reapply the concept to new situations.

F. Allow the students the opportunity to apply the concept through a related activity.

II. Historical Perspective (Develop a time perspective for each concept).

A. Origins and past development

B. Present, state of the art conditions

C. Future implications and applications

II. COURSE DESCRIPTION

Overview: This course, 9th grade Career Exploration in Technology (CEIT) is designed around the study of communication technology from a broad curriculum approach. The course outlines communication technology from a systems perspective and analyzes concepts of the system and subsystems. A model of the communication process is formulated from student input to analyze other systems and related concepts. The process of communication and the technology associated with it, is just as important as the content describing the process.

The 9th grade CEIT course is the second such course at Wahama High School. This course builds on information and knowledge that students have already been exposed to at the 8th grade level. In this way, students will be able to integrate ideas developed about technology, communication, transportation and production.

General Course Objectives:

1. Provide students with fundamental knowledge of technology and its relationship to humankind, society and culture.

2. Develop technological awareness for students through a better perception of their community and environment.

3. Develop in the student an understanding and appreciation of communication technology, its systems and relating subsystems.

4. Identify characteristics, trends and basic concepts of communication technology so that students will better understand how communication technology has affected our society in the past and present, with implications for the future.

5. Provide students with information relating to career roles in communication technology.

6. Develop in students a positive attitude toward safety with tools, materials and machines.

7. Provide students with an opportunity to discover and cultivate basic skills and conceptual thinking in the discipline of technology and related course area, communication technology.

8. Provide students with a variety of experiences to develop problem solving skills.

9. Develop in students the ability to work as individuals and as members of a group.

Content Structure

This content structure of technology and the relationship of communication technology reflects an attempt to organize subject matter for the course, Career Exploration in Technology. Figure I illustrates the relationship of the three areas of content to the discipline of technology. Figure II outlines graphically the area of communication technology by identifying specific content.

Referring to Figure I and beginning at the top, the major thrust or focus of the CEIT course is the study of technology. DeVore (1964) and Shermis (1962) have established technology as a discipline base from which to draw content. To be considered a discipline, technology must meet the following criteria according to DeVore (1964):

(1) has a recognizable and identifiable history;

(2) has an organized body of knowledge;

(3) is related to man's activities and aspirations;

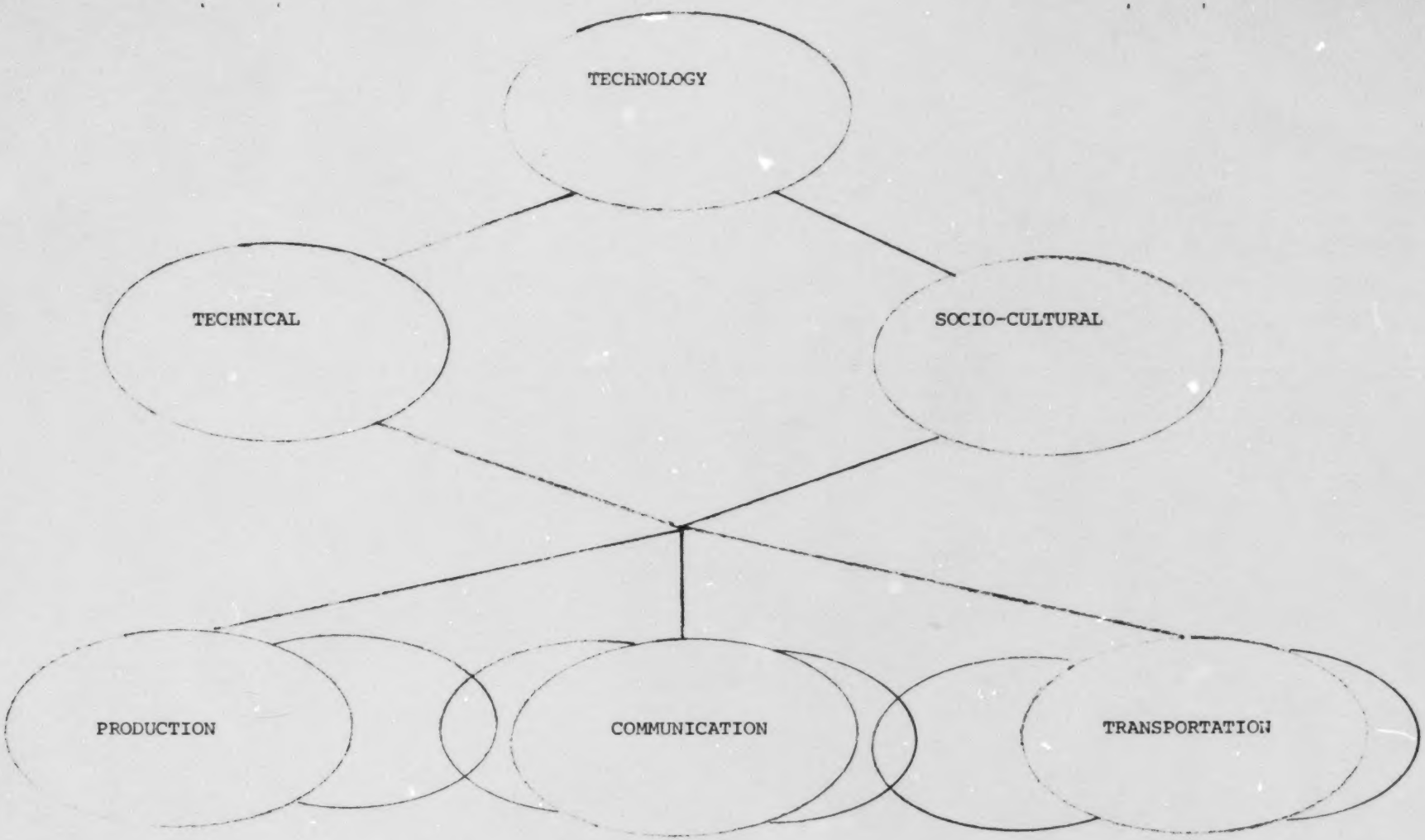


Figure I: Three Major Content Areas of Technology

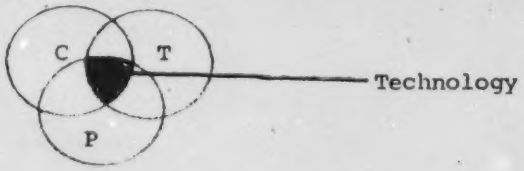
(4) identified as a part of its tradition a considerable achievement in both eminent men and their ideas, and

(5) relates to the future of man.

It appears that technology meets these requirements for becoming a discipline. From this philosophical foundation, content can be divided into two basic concerns: (1) the technical elements, and the (2) socio/cultural elements. This apparent dichotomy of technical and social elements is important because as humans first started to use tools, a vast human reservoir of technics, processes which in turn altered the human way of life. Societies and cultures evolved to adapt to the influence of these tecnnics or technical elements of concern. So, when studying the discipline of technology, it must be realized the technical systems involved in the study of technology directly relate to the cultural activities of society.

If one takes time to analyze the initial development of different civilizations from a social analysis perspective, three major activities can be identified. These include: (1) transporting, both goods and men; (2) producing both goods and services, and (3) communicating, or providing information for dissemination, storage, retrieval, and use. This brings us to the three major content areas illustrated at the bottom of Figure I: I. Production, II. Communication, and III. Transportation.

The major area of concern for this 9th grade CEIT course will be communication technology. It must be realized that while communication will be the main concern of the course, it cannot be divorced from the other two areas, transportation and production because they are inter-related to each other like three connecting rings.



The dark area of the illustration represents the study of technology, the circles represent the boundaries of each content area and the shaded area shows the relationship of curriculum to the other two areas, production and transportation.

Figure II shows further structure by organizing the content of communication technology.

The area of communication technology is comprised of two major divisions. These are: (1) the human factors, and (2) how mankind expends communication abilities through the use of machines. This interface between human and machine is necessary for a basic understanding of communication technology. A working definition of communication

technology is stated as: the extension of man's sensory capabilities through the utilization of machines, tools and processes and their related energy sources. It is from this interfare that content can be organized for the study of communication technology.

A closer look at the human factors of communication technology will reveal the five basic senses used for input. These are: (1) seeing or visual; (2) hearing or acoustic; (3) touch or tactile; (4) taste or gustatory; and (5) smell or olfactory. The synergistic effect of these five senses might create a 6th sense or a type of Extra-Sensory Perception. With these senses, we, as humans, are able to receive information from our environment.

Now, through the use of machines, the basic range of these input senses can be extended to receive a larger amount of information from our environment. An example of this extension can be realized by the use of a microscope and telescope for our eyes. The microscope is capable of examining small items such as atoms and particles, etc. while the telescope can view the surfaces of planets and stars. These devices can completely alter the perspective, we, as humans, have of our earth, environment and universe.

It is from this interfare of humans and machines that form types of communication systems can be analyzed. They are: (1) human to human; (2) human to machine; (3) machine to human; and (4) machine to machine. These systems can be used as a model or framework for organizing content into a communication technology.

Three types of content organizers have been identified to analyze communication technology. These are: (1) Visual Communication Technology Content, or information received through our eyes; (2) Acoustic Communication Technology, or information that is audible to the ears; and (3) Tele-Communication Technology, or the inaudible energy waves that are broadcast through the air or wires. Visual content is concerned with an "image," acoustic content focuses on audible sounds, and tele-communication content is derived from inaudible energy waves. Examples of each of these systems might be:

Visual	Acoustic	Tele-Communication
Image Recording or Photography	Tape Recordings	Satellite Systems
Image Creation or Drawing	Stereo Systems	Microwave Broadcast
Image Transfer or Printing	Telegraph, Telephone	Radar

Each of these organizers is studied from a systems perspective component parts of the system are separated so that students can understand concepts to apply to other communication systems. This system of communication analysis involves six basic steps:

1. Creation
2. Transmission
3. Process
4. Receive
5. Preservation
6. Retrieval

As units of instruction are derived from the three content organizers, this process or system can be applied to each unit. By understanding a simple system, the student can apply this knowledge to a more complex system.

This structure and system of knowledge serves only as a framework for structuring content of communication technology. The curriculum emphasis can be flexible and adapted to individual situations, and as Wahama High School, while the overall structure will remain stable.

The Communication Technology course consists of the following units:

Unit One: Introduction to Communication Technology
Unit Two: Visual Communication Technology
Unit Three: Image Recording
Unit Four: Image Projection
Unit Five: Image Design/Layout
Unit Six: Image Carrier
Unit Seven: Image Transfer
Unit Eight: Introduction to Acoustic Communication Technology
Unit Nine: Acoustic Communication
Unit Ten: Telegraph
Unit Eleven: Telephone
Unit Twelve: Magnetic Reloading
Unit Thirteen: Phonograph
Unit Fourteen: Tele-Communication Technology
Unit Fifteen: Radio
Unit Sixteen: Television
Unit Seventeen: Video Tape
Unit Eighteen: Computer
Unit Nineteen: Satellite

A description of each of the units follows.

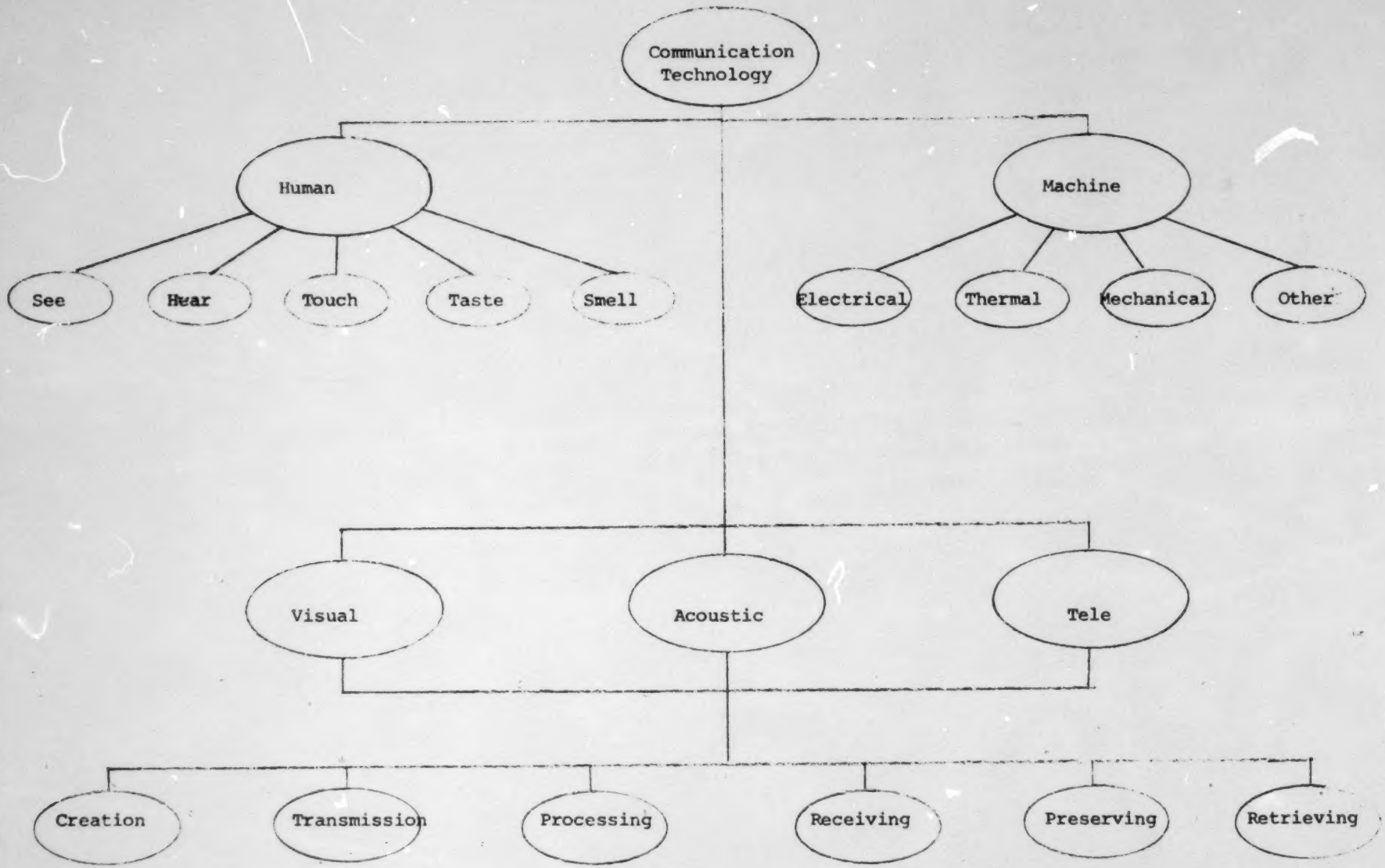


Figure II: Communication Technology Content derived from the Discipline of Technology

Unit One

INTRODUCTION TO COMMUNICATION TECHNOLOGY

A. Overview of Unit: This unit will provide an overview of the entire course. An examination will be made into the meaning of CEIT (Career Exploration in Technology) as a 9th grade course of study and how it relates to the 8th grade CEIT course at Wahama High School. The aspects of careers and technology will be discussed as they relate to the human role, society and our culture. The study of technology will be explained by the interrelationships of the three content areas, Communication (9th grade), Production (8th grade), and Transportation. A distinction will be made between communications and communication technology. This unit will provide definitions, a process and model to approach the area of communication technology. Communication technology will be classified into 3 broad concept organizers (Visual, Acoustic, and Tele-Communication) so that the students can be aware of the scope of communication technology as a whole.

B. Unit Objectives:

1. Cognitive-(knowledge, thinking)

   a. Formulate a workable definition of technology for 9th grade students.

   b. Identify the three content areas for the study of technology: (1) Communication; (2) Transportation; and (3) Production.

   c. Make the distinction between communication and communication technology.

   d. Define each area: (1) Communication; (2) Transportation; and (3) Production.

   e. Establish the vertical hierarchy of societies from basic to advanced.

   f. Provide a working definition of technology assessment, communication and communication technology.

   g. Provide definitions for the past, present, and future.

   h. Outline the basic communication.

   i. Identify the three areas of communication technology: (1) Visual; (2) Acoustical; and (3) Tele-Communication.

j. Provide a historical perspective of communication technology.

2. Affective-(attitudes, values, feelings)

a. Establish a favorable attitude toward the study of technology.

b. Develop an appreciation for technology and its potentials.

c. Establish the importance/dependence of communication in our western culture.

d. Realize the importance of communication technology in our society.

e. Create a favorable appreciation of modern communication systems.

3. Psychomotor-(movement)

a. Reinforce and further develop reading skills.

b. Provide direction for students to begin and organize a useful notebook.

c. Construct a board or model for technology.

d. Construct a bulletin board type timeline for communication technology.

e. Process a clear acetate "contact slide."

Unit One-Introduction to Communication Technology

Time Span	Content	References/Resources	Activities
15-20 sessions	I. Introduction A. School rules B. Class rules II. CEIT (Career Exploration in Technology) A. Explain meaning of words B. Explain relationship of words III. Definition of Technology A. Technical and socio/cultural aspects of technology B. Hierarchy of various societies-simple to advanced C. Three content areas 1. Communication 2. Transportation 3. Production IV. Technology Assessment A. Problems created by technology (all 3 areas) B. Future trends and forecasting V. Difference Between Communication and Communication Technology	Mason County School Manual (Obtained during pre-school inservice). Wahama High School Rule and Operations (Developed by the teacher). Guidelines for Instructional Management of the 9th Grade CEIT, (Developed by the teacher to meet personalized instructional plan). " Structure and Content," by Paul W. DeVore. (Available from the Technology Resource Center, West Virginia University "Access to Tools," by Paul W. DeVore. (Available from the Technology Resource Center, West Virginia University). "Technology Assessment," by Joseph Coates. Synthesized definitions from TE 310 by Dr. J. Barry DuVall. (Available from the West Virginia Technology Education Program).	1. Time Capsule Activity to be used once at the beginning of the school year and again at the end of the year. 2. Develop a workable definition through discussion. 3. Develop a hands-on model of the structure of technology.

Time Span	Content	References/Resources	Activities
	A. Definitions B. Process- 1. Creation 2. Transmission 3. Processing 4. Reception 5. Preservation 6. Retrieval C. Model of Communication-Shannon and Weaver D. Modes 1. Human/human 2. Human/machine 3. Machine/human 4. Machine/machine E. Content-Visual, Acoustic, Telecommunication VI. History of Communication and its Development A. Primitive B. Modern-state of the art	"Communication Projection." 16 mm. Available from TERRC. "A Few Essentials." 16mm. Will Edwards. "Transportation Projection." 16 mm. Available from TERRC. "Communication Explosion." 16 mm. "History of Communications." Filmstrip. "Get the Message." Filmstrip and audio-tape.	4. Pick one area of communication technology, visual, acoustic, or tele-communication and process a contact slide. 5. Classes can construct a linear timeline on the wall or bulletin board. Technical/socio-cultural developments can be added as units of study are completed. (This activity can be year long).

Unit Two

VISUAL COMMUNICATION TECHNOLOGY

A. Overview of Unit: Humans, in their interaction with the environment and other human beings, have the need and desire to express ideas and convey information. The most important and most often used sensory input to the brain is the visual interpretation of our world. Various extensions of the eye will be explored from a historical perspective, common concepts involved, the utilization of a system of visual communication technology and some alternative methods present technology being employed by western civilization.

B. Unit Goals: The major goal for the unit of visual communication technology is to provide the students with an overview to visual communication and the technology necessary to develop systems for conveying information.

1. Introduce to Visual-to provide the fundamental concepts of visual sensors, both man and machine and the principle of light used in visual communication technology.

2. Image Recording-to provide the students with the basic concepts necessary for a fundamental understanding of photography. This will include the equipment, supplies necessary to produce a black and white negative.

3. Image Projection-to provide students with the basic concepts necessary for a fundamental understanding of darkroom techniques. This will include the enlarger, safelights, chemicals and processes necessary to produce a black and white print.

4. Image Design/Layout-to provide an introduction to design techniques, fundamental drawing tools and concepts associated with orthographic and isometric drawing.

5. Image Carrier-to provide a basic understanding of papermaking and the concepts associated with the system of papermaking.

6. Image Transfer-to provide a basic understanding and concepts associated with 3 printing systems: (a) Relief II; (b) Offset III; and (c) Screen.

Unit Two-Visual Communication Technology

Time Span	Content	References/Resources	Activities
4 class meetings	I. Visual Pick-up A. Man's Eye and its Parts B. Machine-Lenses, Optics, Photo-electric cells II. Light A. Basic properties B. Importance of light for visual communication III. Types of light A. Incandescent, luminescent, fluorescent B. Uses of photo-graphy, design, drafting, illus-tration C. History of light usage 1. Past develop-ments 2. Present 3. Future direc-tion-fiber, optics, lasers	Heat, Light, Sound. Curtis International Library of Knowledge, Chapter VI. Lacour, Marshall and Irvin T. Lathroup. Photo Technology. Chicago: American Technical Society, 1972, Chapter III.	1. Construction of a simple lamp. 2. Demonstration of fiber optics.

Unit Three

IMAGE RECORDING

Objectives of the Unit:

I. Cognitive

A. The students will be able to describe the Shannon and Weaver model of communication as it relates to image recording.

B. The students will be able to list and describe 5 significant technical developments in the history of photography.

C. The students will be able to list and describe the six basic chemicals used to process black and white film.

II. Affective

A. The students will be able to appreciate correct exposure of a negative.

B. The students will be able to realize the expense of photographic products because of silver.

III. Psychomotor

A. The students will be able to vary the speed and operation of a 4" x 5" Crown Graphic Camera.

B. The students will be able to shine light through optical fibers.

C. The students will be able to expose one piece of black and white film.

D. The students will be able to process black and white film into negatives.

Unit Three-Image Recording

Time Span	Content	References/Resources	Activities
6 class meetings	I. The Relationship of Image Recording to the Developed Communication Model A. Introduction B. Show prints for students basic understanding of process from unexposed film to negative to photographic print C. Show basic equipment II. The Historical Development of Photography from Aristotle to the 5x 70 III. The Equipment A. Cameras and their basic parts B. Optics-purpose, types, fiber IV. Composition-arranging elements in a viewfinder V. Kinds of Film A. B 7 W B. Color C. Print D. Slide	Lacour, Marshall and Irvin T. Lathrop. Photo Teaching. Chicago: American Technical Society, 1972. Chapters I,II, IV, V, VI, VII, VIII, XII, XX. Popular Photography. Time Mirror Magazine, Inc.	1. Students can follow the process of Image bending through the communication model. 2. Students can vary the speed and operative on a 4" x 5" Crown Graphic camera. 3. Have students shine light through an optical fiber. 4. Have students expose one frame of b & w film. 5. Have students process b & w film into negatives.

Time Span	Content	References/Resources	Activities
	VI. Chemicals used for processing film into negatives A. Developers, stop bomb, fixer, hypo cleaning agent, water, photo flow B. Processing Times/ Temperatures C. Purpose of Chemicals NOTE: These two units are highly related. Emphasis of concepts in Image Recording should be transferred to Image Projection.		

Unit Four

IMAGE PROJECTION

Objectives of the Unit:

I. Cognitive

A. The students will be able to describe the process of Image Projection as it relates to the developed communication model.

B. The students will be able to differentiate between silver chloride and silver bromide.

C. The students will be able to list and describe the basic parts of the enlarger as they relate to the camera.

D. The students will be able to describe the theory of safe light use and photographic paper in the dark room.

E. The students will be able to list and describe the five basic chemicals used to process black and white paper.

II. Affective

A. The students will be able to appreciate a correctly exposed negative when compared with a good black and white print.

B. The students will be able to appreciate a clean negative free from fingerprints, dust and dirt.

C. The students will be able to appreciate the modern photographic process of black and white photography.

III. Psychomotor

A. The students will be able to load a negative into an enlarger and focus the image.

B. The students will be able to frame the image into the enlarging easel.

C. The students will be able to expose one piece of photographic paper.

D. The students will be able to process the exposed photographic paper through the 5 chemicals.

Time Span	Content	References/Resources	Activities
12 class meetings	I. The Relationship of Image Projection to the Developed Communications Model A. Introduction-go step by step through creation, transmission, process, receive storage, retrieval B. General introduction to darkroom procedures II. The Historical Development of Modern Silver Based Photographic Process III. The Equipment A. The Enlarger 1. How it relates to the camera 2. Basic parts B. The Easel 1. Purpose 2. Procedure 3. Use C. Safelight and Photographic Paper-Why they work together? IV. Chemicals Used for Processing a Negative Into a Print	Lacour, Marshall and Irvin T. Lathrop. Photo Technology. Chicago: American Technical Society, 1972, Chapter X. Kodak Company. Creative Darkroom Techniques. Eastman Kodak Company, 1973. Refer to Photographic Pamphlets available from Kodak on basic black and white darkroom techniques.	1. Correctly expose one piece of black and white photographic paper. 2. Process one 5" x 7" black and white photographic print through the chemical. 3. OPTIONAL: Mount photographic print on black matte board.

Time Span	Content	References/Resources	Activities
	A. Developer, stop bath, fixer, hypo-cleaning agent, water B. Processing times/ temperatures C. Purpose of chemical		

Unit Five

IMAGE DESIGN/LAYOUT

Objectives for the Unit:

I. Cognitive

A. The students will be able to describe the English and Metric measurement systems.

B. The students will be able to list and describe at least 6 drawing tools.

C. The students will be able to list and describe the basic materials used in pencils.

D. The students will be able to list and describe the process of sketching and designing.

E. The students will be able to list and describe the orthographic projection techniques.

F. The students will be able to list and describe isometric projection techniques.

II. Affective

A. The students will be able to appreciate modern measurement.

B. The students will be able to appreciate our modern alphabet.

C. The students will be able to recognize the purpose of drafting techniques for industry.

D. The students will be able to appreciate a product or image with good design qualities.

III. Psychomotor

A. The students will be able to experience and use simple layout and drawing tools: ruler; T-square; triangles; protractor; compass; dividers; and drawing board.

B. The students will be able to practice the process of designing.

C. The students will be able to practice the process of sketching.

D. The students will be able to practice the process of drafting using the orthographic and isometric projection techniques.

E. The students will be able to draw and identify simple signs and symbols.

Time Span	Content	References/Resources	Activities
12 class meetings **Keep classes proceeding through all activities with special attention. Allow no idle time. Keep busy!	I. Image Design and Layout A. Introduction: How Image Design/Layout relates to the communications model B. Definitions of design/layout/drawing II. Measurement A. Fundamental to layout and drawing B. Definitions of measurement C. Historical development III. Basic Tools Used for Layout, Design and Drawing A. Historical development of these tools: 1. Compass 2. Dividers 3. T-square 4. Trianges	Mason County Materials Center, Point Pleasant, West Virginia. Language and Communication. Curtis International Publishing Company, 1968, Chapters III and V. French, Thomas E. and Carl L. Svensen. Mechanical Drawing. New York: McGraw Hill Book Co., 1966, Chapters I-VII. Refer to developed materials available on file in CEIT classroom at Wahama High School. Films on drawing are available from Career Education Resources, c/o Will Edwards at Vocational Center.	1. Develop individual competency in both English and metric system through single measurement activities.

Time Span	Content	References/Resources	Activities
	5. Protractor		
	IV. Designing - process from ideas or mental activity to a single visual image A. Historical perspective B. Purposes C. Techniques		2. Ask students to design something simple. For example, a set of steps.
	V. Sketching - process from a simple visual image to a developed sketch - (NOTE: Critical judgment is important to develop a good image). A. State purpose of this process B. Techniques		3. Ask students for a sketch of the steps.
	VI. Drafting Process - industrial communication tool A. Historical development of drafting B. Layout techniques - projection 1. Orthographic projection		4. Student drawing of steps in orthographic projection.

Time Span	Content	References/Resources	Activities
	2. Isometric projection		5. Explain and demonstrate the isometric principle. 6. Student drawing of steps in isometric. **Optional activity for faster students is shading techniques-light direction.
	VII. Use of Signs and Symbols in Communication of Ideas A. Purpose - International type of communication B. Identify signs and symbols		7. Give handout for signs and symbol identification.
	VIII. Signs and Symbol Development into Modern Alphabet A. Hieroglyphics - cave paintings B. Alphabet character development		8. Historical development of the alphabet.

Unit Six

IMAGE CARRIER

Objectives of the Unit:

I. Cognitive

A. The students will be able to list and describe the materials used in papermaking.

B. The students will be able to list and describe three important aspects of paper usage in our society.

C. The students will be able to define: (1) pulp; (2) deckle; (3) watermark; (4) sizing; and (5) couching.

D. The students will be able to list at least one major technical development in the historical development of papermaking.

E. The students will be able to list and describe the components of a papermaking system.

II. Affective

A. The students will be able to appreciate the paper that they write on.

B. The students will be able to realize the importance of paper in our modern society.

C. The students will be able to recognize how easily paper can be recycled.

III. Psychomotor

A. The students will be able to prepare a pulp water solution ratio for papermaking.

B. The students will be able to proceed step-by-step through the board made paper process.

C. The students will be able to recycle junk mail and newspapers.

Time Span	Content	References/Resources	Activities
10 class meetings	I. Image Carrier A. Introduction - Relationship of the Image Carrier to the Developed Communications Model B. Definition of Image Carrier C. What is Paper? II. A Capsule History of Paperworking A. Egyptian Use-Japanese B. American Developments III. Anatomy of Paper A. Inexpensive-Expensive B. Waterworks C. Signing D. Added Color E. Weights F. Materials IV. Process a System of Papermaking A. Preparation of Materials B. Purpose of Water C. "Couching" Procedure	Mason County Material Center, Point Pleasant, West Virginia. Sarjeant, Peter T. Hand Papermaking Manual. Covington, Virginia: Paper Make, 1975, pp. 1-16. Remainder of manual used for reference. For additional free information write: Technical Association of the Pulp and Paper Industry One Dunwoody Park Atlanta, Georgia 30341 (404) 344-6130 Free booklet: "How You Can Make Paper." American Paper Institute, 260 Madison Avenue, New York, New York 10016 Films on Papermaking Industry available from Modern Talking Pictures, Pittsburgh, Pennsylvania.	1. Teacher will demonstrate how to make a piece of handmade paper. 2. Students will prepare an 8½" x 11" piece of paper.

Time Span	Content	References/Resources	Activities
	F. Pressing and Drying		3. Students can look for materials (cards, books, etc.) printed on hand made paper. 4. Recycle junk mail into paper. 5. Take a tour through a paper-mill. 6. Review job possibilities in paper technology.

Unit Seven

IMAGE TRANSFER

Objectives of the Unit:

I. Cognitive

A. The students will be able to differentiate and construct the three major printing systems: (1) Relief; (2) Planographic; and (3) Screen.

B. The students will be able to list and describe the basic materials of ink.

C. The students will be able to list and describe the basic system of relief printing.

D. The students will be able to list and describe the basic system of planographic printing.

E. The students will be able to analyze and comprehend different printing systems used in industry.

II. Affective

A. The students will be able to appreciate modern printing techniques.

B. The students will be able to appreciate the amount of knowledge transferred by print media.

C. The students will be able to realize the power of advertising.

D. The students will be able to value the importance of having mass communication through printing systems.

III. Psychomotor

A. The students will be able to cut and transfer the image of a linoleum block.

B. The students will be able to run an office ditto machine.

C. The students will be able to screen print one item of interest.

D. The students will be able to work safely as an individual or in group efforts.

Unit Seven-Image Transfer

Time Span	Content	References/Resources	Activities
13 class meetings	I. Image Transfer-Relationship of Image Transfer to the Communications Model A. Introduction of Process and Systems of Transfer - (overview) B. Definitions of Image Transfer II. Historical Development A. Uses of Inks 1. Purposes 2. Types 3. Composition of inks B. Printing Systems 1. Early development 2. Present techniques 3. Future trends III. Present Overview of Three Major Printing Systems A. Relief B. Planographic C. Screen Printing D. Stress concepts of one system to be applied to the next	Mason County Material Center, Point Pleasant, West Virginia Language and Communication. Curtis International Publishing Company, 1968, Chapters IV, VIII, X, XI. Kosloff, Albert. Screen Printing Techniques. Signs of the Times Publishing Co., Cincinnati, Ohio, 1972, Chapters I-XIII. Cogoli, John E. Photo Offset Fundamentals. Bloomington, Illinois: McKnight, 1973, Chapters I & II. Films: "We Used to Call It Printing." DuPont memoirs. "Printing Through the Ages." TERRC, West Vriginia University.	

Time Span	Content	References/Resources	Activities
	IV. Relief or Gutenberg Method A. Historical significance B. Concepts		1. Have students develop a Christmas card from linoleum blocks.
	V. Planographic or Offset A. Historical and contemporary significance B. Concepts of Offset		2. Demonstration 3. Trip to the office and demonstration of ditto machine.
	VI. Screen Printing A. Historical development B. Concepts of screen process		4. Screen print Tee shirts for Christmas presents.
	VII. Analysis of Printing Systems		5. Have students look at books, cards, magazines, and newspapers for the three major advertising techniques. 6. Field trip to Point Pleasant Printing Facility.

Unit Eight

INTRODUCTION TO ACOUSTIC COMMUNICATION TECHNOLOGY

A. Overview: Our ability to share experiences, to exchange ideas and to transmit knowledge from one generation to another, to a great extent, is dependent upon our acoustic producing and receiving abilities. Speech and hearing compose humans' ability to communicate with one another and with the environment. This unit will explore various extensions of our ears and voice, common concepts involved, the utilization of a system of Acoustic Communication Technology and some alternative communication being employed in western civilization.

B. Unit Goal: The major goal for the unit of Acoustic Communication Technology is to provide students with an overview of Acoustic Communication and the technology necessary to develop efficient systems for conveying information.

1. Introduction to Acoustics - to provide the fundamental concepts of acoustical sensors, both man and machine, and the principles of sound used in Acoustic Communication Technology.

2. Telegraphy - to provide students with the basic concepts necessary for a fundamental understanding of the telegraph system. This will include: (1) history; (2) schematic representation; (3) circuits; (4) codes; (5) sending/receiving telegrams; (6) project (telegraph model); (7) various code machines; and (8) future developments.

3. Telephone - to provide students with fundamental understanding of the telephone system. This will include: (1) history; (2) schematic representations; (3) circuits; (4) use; (5) types (rotary, touch and tone, coin-operated); (6) telephone manners; (7) emergency calls; (8) parts; (9) confidence; (10) mechanics; (11) use/directory; and (12) future developments.

4. Magnetic Recording - to provide students with an understanding of magnetic recording. This will include: (1) devices (audio and video); (2) comparison with phonograph; (3) importance; (4) components; (5) heads; (6) amplifiers; (7) tape widths; (8) playing speeds; (9) history; (10) erasing; (11) playing back; (12) definition of ferro magnetic; (13) definition of iron oxide; (14) tape magnetization; (15) tape recorder utilization; (16) ovice prints; and (17) future developments.

5. Phonograph - to provide the students with the basic concepts necessary for a fundamental understanding of the phonograph. This will include: (1) history; (2) importance; (3) components; (4) operation; (5) record production; (6) record types (long playing, disc-shaped);

(7) inventor (Thomas Edison); (8) record industry and cutting a record; and (9) future developments.

Unit Nine

ACOUSTIC COMMUNICATION

Objectives of the Unit

I. Cognitive

A. The students will be able to define Acoustic Communication and describe its relationship to our environment.

B. The students will be able to list and describe important definitions dealing with sound.

C. The students will be able to explain fundamental concepts of sound.

D. The students will be able to work problems dealing with the speed of sound through air.

E. The students will be able to identify the parts of the ear.

F. The students will be able to explain how a healthy ear functions.

G. The students will be able to list and describe how people communicated before language.

H. The students will be able to identify the human parts involved in speech.

I. The students will be able to explain how we speak.

J. The students will be able to analyze and evaluate 10 experiments dealing with sound.

K. The students will be able to explain some of the future technical developments in Acoustical Communication Technology.

II. Affective

A. The students will be able to value the importance of Acoustical Communications Technology.

B. The students will be able to appreciate a healthy ear as opposed to a damaged ear.

C. The students will be able to appreciate verbal communication.

III. Psychomotor

A. The students will be able to cut out, label, and color the parts of the ear.

B. The students will be able to trace the propagation of sound through a diagram of an ear on a wall chart.

C. The students will be able to prepare and participate in 10 experiments dealing with sound.

D. The students will be able to demonstrate their (non-verbal) communication ability by acting out a (pantomine).

E. The students will be able to produce a working drawing of an acoustic device.

F. The students will be able to write on paper the procedures for device construction.

G. The students will be able to construct an operational acoustic device.

H. The students will be able to work safely as an individual or in group efforts.

I. The students will be able to place tools and materials back into proper places after use.

Unit Nine-Acoustic Communication

Time Span	Content	References/Resources	Activities
1 class meeting	1. The Anatomy of the Ear and Sound 2. The Sound and the Hearing	Hearing Damage. A guide, Bilson Pub. Co. US-3, Bilson International, Inc., 1930 Isaac Newton Square, East Reston, Virginia 22029. Copy also in CEIT classroom. Neal, Harry Edward. Communication From Stone Age to Space Age, New York: Julian Messner, 1969. TERRC 001.54 COMM Hellman, Hal. Communication in the World of the Future. New York: M. Evans and Co., Inc. TERRC 001.5 COMM Adler and Towne. Looking Out/ Looking In Interpersonal Communication. San Francisco: Rinehart Press, 1975. TERRC 001.54 COMM	1. Worksheets were composed and reprinted from Hearing Damage. (a) Students labeled and colored parts of ear. They also labeled and traced the propagation of sound in a healthy ear. (b) Students read study sheet with instructor and discussed. NOTE: Good explanation in the study sheet of How We Hear.
1 class meeting	3. The Sounds we Hear	"The Sounds We Hear," filmstrip. Located in Mason County Materials Center (MCMC). Series # Wonder of Science. Hogken, Lancelot. The Wonder World of Communication. Garden City, New York: Doubleday and Co. In. TERRC 001.54 COMM	2. Students copied notes from filmstrip. 3. Discussed filmstrip.
1 class meeting	4. Sound	Two Sound Tapes: "Sound." An Imperial tape. Discovery Through Science Series.	4. Tapes were devised for a lower level. Students thought they

Time Span	Content	References/Resources	Activities
		"Let's Find Out." An Imperial tape. Discovery Through Science Series. S6415	were funny. Data on tapes is good. Discuss and tie them into what Acoustical Communication encompasses.
3 class meetings	5. The Sounds We Hear	"The Sounds We Hear." Study and worksheet was composed by James Reyns. A copy may be acquired in the file box labeled "Extra Curricular Materials (E. C. M. M. C. file) CEIT 9th Grade, Wahama High." The file box is located in the TERRC. 2929 University Avenue, Morgantown, W. Va. 26506	5. The work and study sheet contains: (a) rationale for communication; (b) important definitions dealing with sound. Examples are: amplitude, cycle, frequency, etc.; (c) fundamental concepts of sound; (d) speed of sound through air; (3) parts of the ear (outer, middle, inner); and (f) explanation of how an ear works. 6. **(10) experiments with sound which students prepared and presented in class.
1 class meeting	6. Cave Dweller Communication	"Cave Dweller Communication." Reprinted from: American Telephone Co-Telezonia. Spirit duplicating master book. Spirit master #14, 1975. All Telezonia materials may be acquired at Mason County Materials Center.	7. Worksheet was utilized for several purposes: (a) to explain how people communicated before languages-(examples: gestures, expressions, movements.

Time Span	Content	References/Resources	Activities
			(b) to stress the importance of Acoustical Communications; and (c) the non-verbal or pantomine examples from this worksheet were also entertaining.
6 class meetings	7. Acoustic Project	Project worksheet composed by James Reyns. A copy may be acquired in the E.C.M.M.C.	8. During these class sessions students accomplished the following: (a) acquired acoustical device worksheet and developed a working drawing of their proposed project; (b) listed tools and equipment to be utilized; (c) listed materials and cost; (d) developed a procedure for construction of proposed acoustical device; and (e) received approval of project by instructor. NOTE: Also during this activity it was helpful to assign certain job duties to aid class management. For example: shop supervisor clean-up foreman, tool & equipment foremen, etc.

Time Span	Content	References/Resources	Activities
1 class meeting	8. Acoustical device selection for main lobby.	Test entitled "The Sounds We Hear." Acoustical Communications Maybe located in the E.C.M.M.C.	9. 1st half of class session students selected Acoustical devices for show in the cabinets of Wahama's main lobby.
	9. Acoustical Communications test review.		10. 2nd half of class session, students and instructor reviewed for Acoustical Communications test. NOTE: Additional lectures may be needed yhroughout this unit, depending upon the variables involved in the learning environment. Also, materials in this unit may be organized in a different sequence to better suit the learning environment.
1 class meeting	10. Test-The Sounds We Hear, Acoustical Communications	Test located in E.C.M.M.C. Composed by James Reyns.	11. 1st half of class session, class took test. 12. 2nd half of class session was used to evaluate and review the test.

Unit Ten

TELEGRAPH

Objectives of the Unit:

I. Cognitive

A. The students will be able to describe the importance of the telegraph as it relates historically to other communication devices.

B. The students will be able to name the major components in the telegraph circuit.

C. The students will be able to list and identify letters, punctuation, and numerals of the Morse Code.

D. The students will be able to distinguish between open-and-closed circuit telgraph.

E. The students will be able to explain how to send a telegram.

F. The students will be able to describe the difference between the original and continental morse codes.

G. The students will be able to name and describe machines or automatic equipment that speed up the process of sending a telegram.

H. The students will be able to read and determine how to construct a telegraph model.

I. The students will be able to explain some of the future technical developments in the telegraph industry.

II. Affective

A. The students will be able to realize the importance of the telegraph as it relates historically to other communication devices.

B. The students will be able to appreciate automatic equipment that speeds up telegrams.

C. The students will be able to appreciate faster modes or systems of communication.

D. The students will be able to appreciate the importance of sending a message in the Morse Code.

III. Psychomotor

A. The students will be able to gather the materials necessary for the telegraph project.

B. The students will be able to construct a telegraph model using an explanation and working drawing of the telegraph model.

C. The students will be able to trace electric current flow through the telegraph model.

D. The students will be able to identify and solve any malfunctions in the telegraph model.

E. The students will be able to send (encode data) and receive (decode data) in Morse Code.

F. The students will be able to work safely as an individual or in a group effort.

Unit Ten-Telegraph

Time Span	Content	References/Resources	Activities
2 class meetings	1. The Telegraph	"The Telegraph." Study sheet composed by James Reyns. May be found in E.C.M.M.C. Smith, Sidney F. Telephony and Telegraphy-An Introduction to Telephone and Telegraph Instruments and Exchanges. New York: Oxford University Press, 1969. TERRC 621.385 COMM	1. Students read aloud the study sheet in class. 2. Teacher may lecture along with class reading to define vocabulary and clarify important or complete reading and discuss with students afterwards. 3. The study sheet contains the following data: (a) introduction to telegraphy; (b) the telegraph circuit; (c) the Morse Code; (d) open-and-closed circuit telegraphs; (e) sending the telegram; (f) teletypewriters; (g) facsimile machines; (h) automatic switching centers; (i) the carrier system; and (j) radio relay towers.
1 class meeting	2. Telegraph Circuits	"Telegraph Circuits." May be located in E.C.M.M.C. file.	4. Students drew schematic representations of: (a) simple telegraph circuit; (b) open-circuit telegraph system; and (c) closed-circuit telegraph system.

Time Span	Content	References/Resources	Activities
			5. Each circuit showed the following major components: (a) battery; (b) key; (c) line; and (d) receiver, etc.
	3. Telegraph-review questions	"Telegraph." Review questions were composed by James Reyns. Located in E.C.M.M.C. file.	6. Review questions were taken from the study sheet. Students looked up answers for discussion.
4 class meetings	4. The Morse Code 5. Continental Code	May be found in any encyclopedia in the Telegraphy section. Available in E.C.M.M.C. file.	7. Students copied codes from transparency sheet on overhead projector. Students copied: (a) the alphabets; (b) the numerals; and (c) the punctuation. 8. Students wrote each letter, numeral, punctuation, 25 times each to learn. Students were quizzed on the first half of the alphabet, then on the 2nd half. The numerals and punctuation quizzes followed class sessions 7 or 8. After quizzes, students were given the remainder of the period to complete learning experiences. NOTE: I recommend that students learn the International Continental Code as it is now most

Time Span	Content	References/Resources	Activities
			generally accepted over the original Morse Code.
	6. Morse and Continental Code comparison	Data may be found in any encyclopedia. Found in E.C.M.M.C. file.	9. Students used 1st half of class to complete punctuation quiz.
			10. Students in the 2nd half of class compared the two codes. Letters, numerals, punctuation symbols were separated in alike and different lists. Discussion followed.
1 class meeting	7. The Telegraph	"The Telegraph," filmstrip. Series #Wonder of Science-An "Eyegate" filmstrip, 45-S. Available in M.C.M.C. Telegraph filmstrip notes may be acquired in the E.C.M.M.C. file.	11. Students viewed and took notes during filmstrip. Discussed filmstrip afterwards.
	8. Quiz-Telegraph filmstrip	A copy of the telegraph quiz may be found in the E. C. M. M. C. file.	12. Students finished, evaluated and discussed quiz during 1st half of session.
	9. Telegraph Project worksheet	The telegraph project worksheet with materials list may be found in the E.C.M.M.C. file. The project worksheet composed by James Reyns has sections reprinted from Magnets and Magnetism, by Joan Bear, Visuals Books, Grossett and Dunlap Publishers, New York, New York.	13. 2nd half of session was used to read project worksheet and acquire materials for its construction.
			14. Students were given bags labeled according to

Time Span	Content	References/Resources	Activities
			their group and class class period. Each class was divided into 4 groups. Helped organization. Corrected misplaced parts, etc.
6 class meetings	10. Telegraph Project	A compiled telegraph unit be found in the E.C.M.M.C. file. 20 were placed in a box at the Project Open site at Wahama High School in Mason County and labeled "Telegraphy Projects." The project worksheet shows a complete telegraph set with wiring and provides a written step-by-step explanation of its construction.	15. The 1st half of the 12th class session was used to introduce any new equipment, power tools, and safety rules. It was helpful to assign certain job duties to aid class management. For example: shop supervisor, cleanup foreman, tool equipment foreman, etc.
1 class meeting	11. Telegraph Operation	Telegraph worksheet located in E.C.M.M.C. file. Telegraph Morse and Continental Code transparency notes located in E.C.M.M.C. file.	16. Students used their constructed telegraph units to send messages in Morse Code. A line was stretched from junior to senior high through which students sent messages. Students were timed on sending their names and various messages.
1 class meeting	12. Telegraph test review	"The Telegraph." Study sheet the telegraph activity worksheet. Entitled How to Make a Telegraph Set.	17. All previous study sheets, lectures and the activity worksheet composed the final tele-

Time Span	Content	References/Resources	Activities
			graphy comprehensive test. Students and questions during class about test. All materials were reviewed again in class.
1 class meeting	13. Telegraph set	A copy of the test may be located in the E.C.M.M.C. files.	18. Students completed test during 1st half of class period. 19. Students half of class sessions was used to evaluate and review test.

Unit Eleven

TELEPHONE

Objectives of the Unit:

I. Cognitive

A. The students will be able to describe the importance of the telephone as it relates historically to other communication devices.

B. The students will be able to name the components of the telephone system.

C. The students will be able to explain how the total telephone system operates.

D. The students will be able to name the components of the telephone.

E. The students will be able to explain how the telephone works (transmitting and receiver, dial), etc.

F. The students will be able to identify and explain how automated and thinking equipment function at the telephone exchange.

G. The students will be able to identify a relay and explain its function.

H. The students will be able to explain the proper way to use the telephone.

I. The students will be able to distinguish between rotary and touch tone telephones.

J. The students will be able to explain the proper procedure for making an emergency call.

K. The students will be able to explain how to use a coin-operated telephone.

L. The students will be able to explain how to use a telephone book.

M. The students will be able to explain and identify "time zones" and "area code" maps.

II. Affective

A. The students will be able to realize the importance of the telephone as it relates historically to other communication devices.

B. The students will be able to appreciate the telephone as a faster mode of message transportation.

C. The students will be able to appreciate the importance of the telephone as it relates basic and non-basic human needs.

D. The students will be able to appreciate the telephone as it relates to human behaviors.

III. Psychomotor

A. The students will be able to gather the materials necessary for the telephone project.

B. The students will be able to construct a telephone model using an explanation and working drawing of the telephone project.

C. The students will be able to trace electric current flow through the telephone model.

D. The students will be able to identify and solve any malfunctions in the telephone model.

E. The students will be able to make the telephone model operate and use it.

F. The students will be able to remove the covering on a telephone set and explain the functioning of the inward components.

G. The students will be able to work safely as an individual or in a group effort.

Time Span	Content	References/Resources	Activities
3 class meetings	1. Dial telephones	"The Dial Telephone." Study sheet composed by James Reyns with the aid of several sources. It may be found in the E.C.M.M.C. file. Telephony and Telegraphy-An Introduction to Telephone and Telegraph Instruments and Exchanges. Sidney Smith, New York: Oxford University Press, 1969. TERRC 621.385 COMM	1. The study sheet contains the following: (a) rationale and historical significance for the study of the telephone system; (b) an explanation of how the total telephone system works-(transmitter and receiver, comparison of railway and telepone system, how the dial works, telephone exchange, relays, and computers, robts, pre-translators, etc.). Students read the study sheet aloud in class. Sections that were not clear were explained by the instructor. Discussion followed each section. Also during the reading, students underlined most important material designated by instructor.
1 class meeting	2. The Wonder of the Telephone	"The Wonder of the Telephone," filmstrip. Series #Wonder of Science-An Eyegate filmstrip, 45-D available in M.C.M.C. Telephone filmstrip notes may be acquired in the E.C.M.M.C. file.	2. Students viewed and took notes during filmstrip. Discussion of filmstrip afterwards.

Time Span	Content	References/Resources	Activities
1 class meeting	3. How Does the Telephone Work	"How Does the Telephone Work." Study sheet was composed by James Reyns. May be found in the E.C.M.M.C. file.	3. The study sheet contains the following: (a) explanation of telephone parts and how they function; (b) two schematic drawings of telephone components. 4. Students read the study sheet aloud in class. Problems were drawn on the chalkboard so students could better visualize and understand. Students underlined most important data.
	4. Telezonia	"Telezonia." A film produced by American Telephone and telegraph company is a 27 minute, 16 mm sound, color motion picture, 1975. Located in the M.C.M.C. The "Telezonia" film and other telezonia instructional aides may be obtained by contacting your nearest Bell Telephone office.	5. Students viewed the film and discussed afterwards. Contents of the film were: (a) how to use telephone; (b) parts of telephone; (c) rotary and touch-tone telephones; (d) how to make an emergency call; (e) how to use coin-operated telephones; and (f) telephone manners. NOTE: Telezonia film was devised for lower level students.

Time Span	Content	References/Resources	Activities
2 class meetings	5. Telezonia worksheets	"Telezonia worksheets," were reproduced from the "Telezonia" spirit master book ay AT&T, 1975. Located in M.C.M.C.	6. Students completed the 12 activity sheets in class-6 per day. 7. Have students bring in telephone books prior to activity sheets. Titles of the activity sheets are as follows: (a) Emergency; (b) Monsterville Telephone Directory; (c) White Pages; (d) Yellow pages; (e) A Hunt in the Yellow Pages; (f) My Telephone Book/Part I; (g) My Telephone Book/ Part II; (h) The Communication Time Line/Part I; (i) The Communication Time Line/Part II; (j) The Time Zone and Area Code Map; (k) Time Zones and Area Codes; and (l) How the Telephone Works (Quiz). NOTE: Students not finishing worksheets in class did so for homework.
1 class meeting	6. Teletrainer	A teletrainer is located in the M.C.M.C. The Bell System makes available to classrooms The Teletrainer Unit which consists of two activated telephones and a loudspeaker	8. During the 1st part of the class session, students were given data in a lecture on how to operate the equipment. Students

Time Span	Content	References/Resources	Activities
		control unit. To borrow the teletrainer unit contact the nearest Bell Telephone office.	utilized remainder of class session to operate the teletrainer. Previous materials on how the telephone works, etc. can be related to actual parts and situations in the unit and with the unit. Specifically, the teletrainer will: (a) advance pupils' imagination and learning through realistic role playing; (b) help develop speaking and listening skills; (c) reinforce need for courtesy and good manners; (d) increase confidence in telephone situations; (e) encourage shy pupils to participate in social interaction; and (f) demonstrate the mechanics of the telephone. NOTE: The Telezonia manual provides instructions on (a) setting of the teletrainer; (b) operation of the tele-trainer operator.

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Time Span	Content	References/Resources	Activities
4 class meetings	7. Telezonia-filmstrip	Seven filmstrips. Six with accompanying sound cassettes, one with booklet. Filmstrips are located in M.C.M.C. May acquire also through nearest Bell Telephone office. Titles of filmstrips: #1 "How We Use the Telephne" #2 "History of Communication" #3 "The Telephone in Your Community" #4 "How the Telephone Works" #5 "How We Use the Telephone Directory/Part I" #6 "How We Use the Telephone Directory/Part II" #7 "Come Work with us In a Telephone Company"	9. Two filmstrips were viewed each class session and discussed. Students seemed to like filmstrips. Students took notes during filmstrips. A copy of the notes students wrote can be found in in the E.C.M.M.C.
5 class meetings	8. How to Make a Simple Telephone	"How to Make a Simple Telephone," worksheet may be located in the E.C.M.M.C. file. The project work sheet composed by James Reyns was reprinted from Magnets and Magnetism by John Bear, Visual Books, Grossett and Dunlap Publishers, New York, New York.	10. Students used the 14th class session to read worksheet, to study working drawing, and to gather materials. 11. Students utilized bags from telegraph activity again for organization and to prevent misplaced parts. NOTE: This activity went well. It really helped most students to actually visualize how the

Time Span	Content	References/Resources	Activities
			telephone functions. 12. Students used the 18th class session for demonstration of their device and its actual use. Good activity.
1 class meeting	9. Telephone Test review	"The Telephone Test" contained the following study sheets, lectures and instructional materials: (a) Dial Telephone Handout; (b) The Wonder of the Telephone filmstrip; (c) How Does the Telephone Work, study sheet; (d) Telezonia filmstrip notes; (e) How to Make a Simple Telephone, worksheet.	13. Students and the instructor reviewed all of the previous instructional materials listed. 14. Students asked questions and responses were supplied by the instructor.
1 class meeting	10. Telephone Test	Test composed by James Reyns is located in the E.C.M.M.C.	15. Students utilized 1st half of class session to take test. 16. Second half was used to evaluate and review the test.

Unit Twelve

MAGNETIC RECORDING

Objectives of the Unit:

I. Cognitive

A. The students will be able to describe the importance of magnetic recording devices and how they relate historically to other communication devices.

B. The students will be able to explain the evolution of major tape recording devices.

C. The students will be able to compare magnetic tape recording and phonographic devices.

D. The students will be able to describe the standard components and features of tape recording units.

E. The students will be able to describe how an audio-tape recorder works.

F. The students will be able to explain: recording, erasing, and playing back.

G. The students will be able to explain the recording head as an electromagnet.

H. The students will be able to define and describe recording amplifier.

I. The students will be able to identify and explain tape widths and playing speeds.

J. The students will be able to name and describe the related and non-related components and features of various types of audio-tape recorders.

K. The students will be able to identify other types of magnetic recording devices and explain their related components and features.

L. The student will identify various types of tape supplies. (Examples: cartridge, cassette, reel-to-reel).

M. The student will be able to explain how tapes are magnetized.

N. The student will be able to explain future technical developments in the magnetic recording.

II. Affective

A. The students will be able to realize the importance of magnetic recording devices as they relate historically to other communication devices.

B. The students will be able to appreciate magnetic recording devices for the capabilities of recording, preserving, and retrieving data.

C. The students will be able to appreciate magnetic recording devices for their basic and non-basic human needs.

D. The students will be able to appreciate their own voice print.

III. Psychomotor

A. The students will be able to gather and set-up the necessary equipment for tape recording on various units.

B. The students will be able to record their voice on various types of tape recorders and play it back.

C. The students will be able to erase a tape on the recorder or with a portable electromagnet.

D. The students will be able to erase and to tape over sections of a previous recording.

Time Span	Content	References/Resources	Activities
2 class meetings	1. Tape Recorders Part I	"Tape Recorders," Part I is a study sheet composed by James Reyns. May be located in E.C.M.M.C. Pear, C. B. Magnetic Recording in Science and Industry., 1967. TERRC 621.389 COMM. Keen, Marvin L. Magnets and Magnetism, 1963. TERRC 372 Ed. Pine and Levine. Magnets and How to Use Them, 1958. TERRC 372 Ed.	1. Students read study sheet aloud in class. They underlined most important data and discussed with instructor. Instructor used chalkboard to clarify problem data. This study sheet: (a) descriptions of taping recording devices; (b) brief comparison of tape recorders and phonographs' (c) importance of tape recording devices; (d) how an audio tape recorder works and components; (e) recording, erasing, playing back; (f) recording head (electro-magnet); (g) recording amplifier; (h) kinds of audio tape recorders (reel-to-reel, cassette, cartridge, stereophonic, dictating machines); (i) kinds of tape recording (video tape, computer tape, instrumentation tape); and (j) history of tape recording. NOTE: Excellent worksheet.

Time Span	Content	References/Resources	Activities
2 class meetings	2. Tape Recorders Part II	"Tape Recorders," Part II is a study sheet composed by James Reyns. May be located in E.C.M.M.C.	2. Students read study sheet aloud in class, underlined most important data, and discussed with instructor. This study sheet contains the following data: (a) rationale for study of recording devices; (b) how the tape recorder works; (c) history and development; (d) a drawing of a reel-to-reel; and (e) a drawing depicting how recording is done on magnetic tape and how it is erased.
1 class meeting	3. Magnetic Recording Transparency notes	The Transparency notes may be located in the E.C.M.M.C. file.	3. Students copied the following notes from a lecture prepared by James Reyns. The lecture included the following: (a) Definition of ferrous; (b) Definition of Magnetic; (c) Definition of Ferro-magnetic; (d) Definition of iron oxide; (e) An example of a ferro-magnetic material not magnetized;

Time Span	Content	References/Resources	Activities
			(f) Explanation of how the components of a tape recorder magnetize particles on tape; (g) A transparency sheet was folded in half with iron filings in the middle; Have students note the pattern of the filings when you move a magnet across the transparency sheet. (h) Relate to how magnetic particles on a cartridge, cassette, etc. tape are magnetized into a specific pattern; and (i) Discuss playback, record, and erase.
2 class meetings	4. Voice Prints Part I	Reel-to-reel tape recording unit was borrowed from TERRC, 2929 University Avenue, Morgantown, W. Va.	4. Using the "Tape Recorder," Part II study sheet aided the in class demonstration of how an audio tape recorder works. Components were pointed to by the instructor from the worksheet for students. An explanation of how each part and component functions was given also. The tape recorder was demonstrated by the instructor by recording, playing back, and erasing his own voice. All students duplicated the

Time Span	Content	References/Resources	Activities
			the instroctor's demonstration. Many students could not believe their own voice prints. NOTE: A print with all students voice-prints in CEIT, 9th grade, 1977-78 has been recorded and may be located in E.C.M.M.C. file. **Good activity.
1 class meeting	5. Voice Prints Part II	Reel-to-reel tape recording unit was borrowed from TERRC, 2929 University Avenue, Morgantown, West Virginia.	5. Students used class session to tape conversations with other school personnel. Students played back the personnels voice prints. 6. The original activity design for this unit was for students to interview people with various occupations or careers. This concept works itself into the course title CEIT or Career Exploration in Technology. NOTE: Students were to use cassette recorders from home and the TERRC for the career recorings.

Time Span	Content	References/Resources	Activities
1 class meeting	6. Magnetic Recording test review	The Magnetic Recording test contained the following instructional materials, etc.: #1 "Tape Recorders," Part I study sheet; #2 "Tape Recorders," Part II study sheet; #3 "Magnetic Recording Transparency Notes"; and #4 Lecture reel-to-reel recorder.	7. Students and the instructor reviewed all of the previous instructional materials listed. Students asked questions and responses were supplied by the instructor.
1 class meeting	7. Magnetic Recording test	Test composed by James Reyns may by located in the E.C.M.M.C.	8. Students utilized 1st half of class session to take test. 9. Second half of class session was used to evaluate and review the test.

Unit Thirteen

PHONOGRAPH

Objectives of the Unit:

I. Cognitive

A. The students will be able to describe the importance of the phonograph as it relates historically to other communication devices.

B. The students will be able to identify dates of major historical phonograph events.

C. The students will be able to name and describe the significant changes that took place in phonograph evolution.

D. The students will be able to recognize Thomas Edison's achievements with the phonograph and some of his other major inventions.

E. The students will be able to name the standard components and features of contemporary phonographs.

F. The students will be able to describe how a phonograph works.

G. The students will be able to describe some significant impacts of the American Recording Insustry on American culture and society.

H. The students will be able to explain key technical concepts supporting the American Recording Industry.

I. The students will be able to describe how a record is made packaged and distributed. The students will be able to explain why disc-shaped records replaced cylinder records.

J. The students will be able to explain the basic features of phonograph records. (Examples: composition sizes, playing speeds, etc.).

K. The students will be able to explain some of the future technical developments in the phonograph and recording industries.

II. Affective

A. The students will be able to realize the importance of the phonograph and recording industry as they relate historically to other communication devices.

B. The students will be able to appreciate phonograph records for their educational and entertaining value.

C. The students will be able to appreciate the phonograph and phonograph records for their basic and non-basic human needs.

D. The students will be able to appreciate the phonograph and phonograph records as they relate to human behaviors.

III. Psychomotor

A. The students will be able to gather the materials and tools necessary for the phonographic project.

B. The students will be able to construct a phonograph model using an explanation and working drawing of the phonograph project.

C. The students will be able to encode a message onto a piece of tin foil.

D. The students will be able to identify and solve any malfunctions in the phonograph need.

E. The students will be able to make the phonograph model operational.

F. The students will be able to work safely.

Unit Thirteen-Phonograph

Time Span	Content	References/Resources	Activities
1 class meeting	1. The Wonder of the Phonograph	"The Wonder of the Phonograph," filmstrip. Series #Wonder of Science, An Eyegate Filmstrip, 45-G available from M.C.M.C. Phonograph filmstrip notes may be acquired in the E.C.M.M.C. file.	1. Students viewed and took notes during filmstrip. Discussed filmstrip.
1 class meeting	2. Phonograph	"The Talking Machine." 16mm film from Tinfoil to the L.P. Available from Screen News Digest, 235 East 45th Street, New York, New York 10017 Film may also be found at the M.C.M.C.	2. Students viewed the film and took notes. Discussion of the film followed.
1 class meeting	3. The Talking Machine from Tinfoil to the LP	"The Talking Machine," from Tinfoil to LP. discussion outline is a two page study sheet describing the important persons, places and fact behind the phonograph. A copy may be obtained by writing: The Hearst Metrotone News A Division of the Hearst Corp. Copyright-1977. A copy may be obtained at the M.C.M.C. Ask for Vol. XX, No. 4.	3. Students paired to read and answer the review questions at the end of this study sheet since there were only 10 copies. This study hsset followed with the film. 4. Students took notes from the film study sheet.
1 class meeting	4. Phonograph test review	The Phonograph test contained the following instructional aides: #1 "The Wonder of the Phonograph" filmstrip notes; and #2 "The Talking Machine," study sheet and film.	5. Students and the instructor reviewed all of the previous instructional materials listed. 6. Students asked questions

Time Span	Content	References/Resources	Activities
			and responses were supplied by the instructor.
	5. Phonograph test	Test composed by James Reyns is located in the E.C.M.M.C.	7. Students utilized the 1st half of class to take test. 8. Second half was used to evaluate and review the test. NOTE: This unit did not have a phonograph project and was not developed fully due to missed days of school. I would suggest a project to the one on "The Talking Machine." Study sheet to provide conceptional learning and complete a good unit.

SPECIAL NOTE

In the third and final year of this project, the course content for the spring semester was completely changed for two reasons. (1) The content was changed to better meet the criteria for a study of Communication Technology, and (2) The content was changed to better meet the educational needs for the students concerned. During the spring semester several uncontrollable problems occurred that interrupted the course schedule and content. For example, school was dismissed for one month due to snow days. The units in Acoustic Communication were completed. However, the units included with the study of Tele-Communication Devices were not fully developed for lack of classroom time (Units 14-19).

In the remaining units dealing with Tele-Communication you will find instructional materials and information that will aid in the development and instruction of these units. Instructional materials that are mentioned and available can be located in the E.C.M.M.C. files. Possible unit outlines are given in the Television and Video-Tape units.

Time Span	Content	References/Resources	Activities
	NOTE: A content structure was not developed for this unit. The study of Tele-Communication Devices maintain an intrinsic part to the total Communication Technology course and should be fully developed. This section like the remaining 6 can and should be developed fully from the information given.	Brown, Ronald. Telecommunications The Becoming Technology. Garden City, New York: Doubleday & Co., Inc., 1970. Located in TERRC 384 COMM Gray and Hanneman. The Telecommunications Transportation Tradeoff. New York: Jon Wiley & Sons, Inc. 1976. Located in TERRC 384 COMM. Electricity/Electronics references can be located in most libraries, bookstores, etc. Electricity/Electronics fundamentals apply to all Tele-Communications Devices and activities.	Possible activities: 1. Discuss with students: (a) What is Tele-Communication? (b) What are some examples? (c) Relate to visual and acoustic communication, etc.

Unit Fifteen-Radio

Time Span	Content	References/Resources	Activities
	NOTE: A content structure was not developed for this unit. Many good references are listed.	Radio Amateur's Handbook, The American Radio Relay League, 19 1969. Located in TERRC 621.384 COMM. Marcus, Abraham. Radio Projects, 1955. Located in TERRC 621.3 COMM. Oldfield, R. L. Radio-Television and Basic Electronics, 1960. Located in TERRC 621.384 COMM. Radio-Television Electronics Dictionary. National Radio Institute, 1962. Located in TERRC 621.3 COMM. Matthews, R. A. Radio Wave Propagation on U.H.F.and Above, 1965. Chapman and Hall Ltd., 11 New Fetter Lane, London EC4. Located in TERRC 384 COMM. Radio Waves. 621.384 COMM. Radio Kits and Models found in TERRC: #63 Lectron-8 transistor radio experimentor unit #73 Transmitter AM #74 Transmitter I.F. Amplifier #75 Transmitter Mixer Oscillator #76 Transmitter Audio Amplifier #95 Simpson Volt-DHM Meter	Project Activities: Radio Shack-A Tandy Co. produces many good kits to provide learning of radio principles and concepts. Some of the kits are: #1. Crystal Radio Kit #2. AM Radio Kit #3. FM Radio Kit #4. AM-FM Radio Kit

Time Span	Content	References/Resources	Activities
		NOTE: Various radio kits were purchased by J. Reyns for the project. Located in 9th grade CEIT classroom Wahama High School, Mason, W. Va.	

Unit Sixteen-Television

Time Span	Content	References/Resources	Activities
1 class meeting	NOTE: The following format is a possible content structure for this unit. Most of the instructional material mentioned may be located in the E.C.M.M.C. file.	NOTE: The following list of instructional aides may be utilized.	
	Pre-Test/Discussion	Radio-Television Electronics Dictionary, 1962. National Radio Institute. Located in TERRC 621.3 COMM.	
	1. Pre-Test	Oldfield, R. L. Radio-Television and Basic Electronics, 1960. Located in TERRC 621.384 COMM.	Activities: Can be composed from the references listed for progress with the possible content structure.
	2. Information sheet	Television, Vol. III-E. Learning Systems, Inc., Located in TERRC 375 ED.	
	3. Talk about where to get television information.	Eastman, Gerald A. Television Systems, 1969. Located in TERRC 621.3 COMM.	
	4. Have students to to TV dealers to acquire information.	Ennes, Harold E. Television Tape Fundamentals, 1968. Howard W. Sams & Co., Inc., The Bobbs-Merrill Co., Inc. Located in TERRC 621.388 COMM.	
	5. Call TV dealers (students coming)		
1 class meeting	6. Give handout-"Getting the Most Out of Your Television."	Eastman, Gerald A. Television Waveform Processing Circuits, 1968. Located in TERRC 621.3 COMM.	Lecture/discussion
	7. Discuss what students acquired from TV dealers		Discussion
	8. The importance of TV (a) Public (b) Educational (c) Entertainment		Discussion

Time Span	Content	References/Resources	Activities
	9. Who makes TV's? Types of TV's: (a) manual (b) black and white (c) color (d) computer		Discussion
	10. Future types (a) 3-D (b) giant screen (c) TV's that tape while you're gone		Discussion
	11. Make available additional handouts.		
1 class meeting	12. Make up TV survey and administer.		Discussion
1 class meeting	13. Give handouts	B.E.S.T. Unit 4 Communications, pp. 69-75 and pp. 76-80.	Students supply answers to questions. Discuss with instructor.
1 class meeting	14. Finish discussion from previous day.		
	15. Show TV films		Students take notes from films.
1 class meeting	16. Contrast TV and Communications Model		Lecture/discussion
	17. Explain TV is Tele-Acoust Visual Communication device		
	18. Explain basically, How		

Time Span	Content	References/Resources	Activities
	The TV Works from transmitter to receiver		NOTE: Bring in TV repairman for guest speaker.
	19. Point to various components in TV- Identify from cover of TV to electronic units		
	20. Give handout on Radar/TV. Homework		
1 class meeting	21. Make up pop-quiz		
	22. Grade quiz while students review hand-out		
	23. Give Television Trans-mission handout		
1 class meeting	24. Discuss transmitter		
	25. Give handout on receiver		
	26. Teacher entertains questions		Discussion
1 class meeting	27. Discusss receiver		
	28. Show film		Discussion
	29. Review sheet for test		

Time Span	Content	References/Resources	Activities
1 class meeting	30. Give test 31. Teacher entertains questions 32. Inform students of next area of study		

Time Span	Content	References/Resources	Activities
	NOTE: The following format is a possible content structure for this unit. Most of the instructional materials mentioned may be located in the E.C.M.M.C. file.	NOTE: The following list of instructional aides may be utilized.	NOTE: The possible content structure for this unit progreees toward a major Video-Taping activity.
1 class meeting	1. Talk about Video equipment 2. Talk about equipment costs 3. Give magnetic tape handout	Fang, Irving E. Television News, 1968. New York: Hastings House. Located in TERRC 621.388 COMM. Enness Harold E. Television Tape Fundamentals, 1968. New York: Howard W. Sams & Co., Inc., The Bobbs-Merrill Co., Inc. Located in TERRC 621.388 COMM. Audio/Visual Library, West Virginia University, Morgantown, West Virginia (304) 293-4019 Peterson's Guide to Video Taping locating in most bookstores and libraries.	Discussion
	4. Give parts handout 5. Talk about parts 6. Make a list of students and the part they want	Enness, Harold E. Television Broadcasting Tape and Disc Recording Systems, 1973. AGI-SCI/Engineering Library, West Virginia University Campus	Lecture

Time Span	Content	References/Resources	Activities
1 class meeting	7. Divide class into groups Examples: actors, writers, stagehands, etc.	Kybett, Harry. TK-6655-E5E54-Video Tape Recorders, 1974. AGI-SCI/Engineering Library, West Virginia University.	
	8. Students discuss parts/ roles	Murray, Michael. TK-6655-U5K9 The Video Tape Book-A Basic Guide to Portable TV Production, 1975. AGI-SCI/Engineering Library West Virginia University.	
	9. Students discuss what they want to video tape		
1 class meeting	10. Students and teacher work together to develop video-tape written section. Equipment-students and teacher practice with equipment	TK-6655-Z5M87-The Spigetti City-Video Manual-A Guide to Use Repair and Maintenance. 1973. TK-6655-Z5Z55 AGI-SCI/Engineering Library, West Virginia University	
1 class meeting	11. Students turn in written rough draft of video tape to teacher while other students practice with equipment	Other references and resources may be found in the TK-6655 section dealing with Viceo-Taping in the AGI-SCI/Engineering library at West Virginia University.	
	12. Students finish written draft for taping of skits, etc.	Contact Mr. Will Edwards for possible use of a V.T.R. (Video Tape Recorder) at the Mason County Vocational School, Point Pleasant, W. Va.	
1 class meeting	13. Give pre-production handout		
	14. Discuss after students read		
	15. Help students with practice problems, back		

Time Span	Content	References/Resources	Activities
	drops, acting, special sound effects, etc.		
1 class meeting	16. Give motion picture production handout		
	17. Discuss handout		
	18. Help students with practice problems		
1 class meeting	19. Help students complete "dry run" of video-tape		
	20. Complete "dry run" of video-tape		
1 class meeting	21. Help with complete taping of show		
	22. Complete taping of show		
1 class meeting	23. Play back and discuss completed video-tape		
	24. Discusss with students		

Time Span	Content	References/Resources	Activities
	NOTE: A content structure was not developed for this unit. A unit could be composed from the references and activities listed.	Jacobs, Zeney P. Communicating with the Computer, 1973. Boston: Allyn and Bacon, Inc. TERRC 621.3819 COMM. It also has a teachers guide to go with text. Stine, Herman Gold. The Computer. Princeton, New Jersey: Princeton University Press, 1972. TERRC 609 . Baker, Justine. The Computer in the School, Fastback #58. Phi Delta Kappa Educational Foundation, 1975. TERRC 370 ED. Anderson, Decima. Computer Programming. New York: Appleton-Century Crofts, 1966. TERRC 621.3819 COMM. Rusch, Richard B. Computers: Their History and How They Work. New York: Simon & Schuster, 1969. TERRC 621.3819 COMM.	1. Compare Usage Fundamentals, 1969. Edited by Eric A. Weiss. TERRC 621.3819 COMM. 2. Ashworth, Alton W. Computers and Careers: A Suggested Curriculum for Grades 9-12. Kolleen, Texas: Central Texas College, 1973. TERRC 371.42 ED. 3. An Edmund Analog Computer Game may be found in TERRC #69. Edmund Scientific Co., Barrington, New Jersey 08007. 4. Comput-A-Tutor Game. It may be found in #7 TERRC. Distributed by Didactic Systems Inc., Box 500, Westbury, N. Y. 11590. 5. Digital Computer Game also located in TERRC-#62. NOTE: Several computer kits were purchased by James Reyns for the project. Located in 9th Grade CEIT classroom, Wahama High School, Mason, W.Va.

Unit Nineteen-Satellite

Time Span	Content	References/Resources	Activities
Total 10 class meetings	Note: No content structure was developed for this unit. However, one could easily be structured from the reference listed. Sometimes complete data as to location of information may not be given. One should be able to acquire these materils with mininal inquiry. My purpose is to inform the reader that many data sources do exist.	Lukashok, Alvin. Communication Satellites-How They Work. New York: G.P. Putnam's Sons, 1967. TERRC 621.3801 COMM. Signals to Satellites, ETTA Schneider Press. Published by Creative Ed. Society, Inc., 1965. TERRC 621.3801 COMM. Foster, Ronald M. (ed). Satellite Communications Physics, 1963. Bell Telephone Labs, Inc. TERRC 621.3801 COMM. Pierce, John R. Science/Art Communication. New York: Clarkson N. Potter, Inc., 1968. TERRC 621.3801 COMM. Jones, Erin Bain. Earth Satellite Communications Systems and International Law. Austin, Texas: The University of Texas at Austin, 1970. TERRC 621.3801 COMM. Comsat Annual Report to the President and the Congress, Communications Satellite Corp., Washington, D. C. May 31, 1971. TERRC 621.3801 COMM. "Satellite Communication." film by Comsat.	NOTE: Possible activities could be: #1. Participation in group project activity of a graphic display showing a complete Satellite Communication System; #2. Students develop an indepth research report on how satellites work.

Time Span	Content	References/Resources	Activities
		Brochures "Intelsat Research and Development Program." "Putting Satellites to Work.' "Data Communication Via Satellite" "Solar Cell Developments." (DIGISAT) "A New Global Satellite Medium Speed Digital Communicators Service." "Putting Satellites Together." Booklet: by NASH, The Best of Trios. Films: "Hurricane Below." by NASA. "Space in the 70's-Space Down to Earth." by NASA. "ERTS-Earth: Resources, Technology Satellite." by NASA. Laskin, Paul. Communication by Satellite. "Satellites: Servants in the Sky." Screen News Digest, 235 E. 45th Street, New York, New York 10017.	